MATHEMATICS CURRICULUM

We are a community of learners

Personalised curriculum

Enhancement and enrichment activities

Basic curriculum

fostering and developing a life-long love of learning

'Mathematics is not about numbers, equations, computations, or algorithms: it is about understanding'

William Paul Thurston

Nascot Wood Junior School – Mathematics Intent and Implementation

Mathematics: Intent

Purpose

Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. Therefore, a high-quality mathematics education provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

Aims

The National Curriculum for Mathematics aims to ensure that all pupils:

- become fluent in the fundamentals of mathematics, including through varied and frequent practise with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas.

The programmes of study are, by necessity, organised into apparently distinct domains, but pupils should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge to science and other subjects.

The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace. However, decisions about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage.

Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.

Curriculum Implementation

At Nascot Wood Junior School, children study mathematics daily, covering a broad and balanced mathematical curriculum including elements of number, calculation, geometry, measures and statistics. Alongside daily mathematics lessons, we aim to teach mathematics in a cross-curricular manner as well as discretely to teach the practical application of mathematical skills. This is due to the interconnected nature of mathematics. We focus not only on the mathematical methods but also on mathematical vocabulary and to use Maths Mastery to broaden and deepen mathematical understanding.

We aim for each child to be confident in their yearly objectives and develop their ability to use this knowledge to develop a greater depth understanding to solve varied fluency problems as well as problem solving and reasoning questions. Although we have the Herts for Learning Essential Planning as the backbone of our mathematics teaching, we use a range of textbooks and online resources throughout the school to ensure a curriculum that is specific to each child's learning needs. Parents are encouraged to subscribe to the on line programme, Maths Whizz, which aims to build pupil engagement and consolidate mathematical knowledge.

From the 2019/20 academic year onwards, schools in England will be required to administer an online multiplication tables check (MTC) to year 4 pupils. The purpose of the MTC is to determine whether pupils can recall their times tables fluently, which is essential for future success in mathematics. It will help schools to identify pupils who have not yet mastered their times tables, so that additional support can be provided. To support the children with their multiplication practice we use 'Times Table Rockstars' as an online and fun learning platform which also offer resources to be used in the classroom. We also use concrete modelling and monitor progress using times table grids. Please note that the school was used to pilot the online multiplication tables check.

The Year 3 Learner

Working mathematically

By the end of year 3, children will talk about their mathematics using the numbers they are familiar with, applying their understanding of number, measures and shape to a greater range of problems. They will make decisions about calculations and information that is needed to solve problems, for example when a recipe for two people needs to be doubled to make a recipe for four. Children will be expected to prove their thinking through pictures, jottings and conversations. They will be encouraged to pose their own questions, working in an organised way to solve them which will help pupils to identify common patterns or any errors more easily.

Number

- **Counting and understanding numbers**

Children will be very familiar with numbers that have 3 digits and will have experienced many opportunities to order, compare and show them in different ways using apparatus such as a tape measure, a 100 grid or money. Using their understanding of place value (how the value of each digit changes depending on its position in the number), children will be able to partition (break and make) numbers in different ways e.g. 234 = 200 and 30 and 4; 100 and 100 and 20 and 10 and 4; *or* 200 and 20 and 14. They will develop a secure understanding of numbers up to 1000 and will count beyond it in 1s, 10s and 100s. They will use this counting to help find 10 or 100 more than any given number.

Children will be introduced to numbers with one decimal place and will count up and down in tenths; share groups of objects or shapes into tenths and represent these in pictures and using hands-on resources.

Children will count forwards and backwards from 0 in steps of 4, 8, 50 and 100 and link this to multiplication and division. They will also count in 3s to help maintain their fluency from Year 2.

- **Calculating**

Children will continue to develop their mental calculation skills to add and subtract combinations of three-digit numbers e.g. 248 +/- 8; 319 +/- 40; 428 +/- 200. They will develop their range of strategies using jottings (sketches and notes to help them remember the steps) and number lines to help them understand how each calculation works. Children will share their methods with others to help them see which work best, are quickest and most accurate. Children will understand the importance of estimation when calculating to see if their answer is reasonable or not. They will recall their multiplication and division facts for 3, 4 and 8x tables and be supported to see the links between the 2, 4 and 8x tables. They explore patterns and rules for the times tables they learn and will use pictures and objects to support their understanding. They will also learn that multiplication can be done in any order e.g. 3 x 4 x 2 = 2 x 3 x 4.

Children will be introduced to more formal methods of recording addition and subtraction, including column methods. They will use hands-on resources to secure their understanding of these methods. This will be applied to numbers up to three digits. Children who become very adept at these calculations will be stretched through problems such as those involving missing numbers so that they know when, if and why they need to use these methods.

Children will develop their understanding of multiplication and division and apply their times table knowledge to multiply 2-digit by 1-digit numbers using the skills of partitioning (breaking and making numbers). For example, 43 x 5 can also be thought of as 40 x 5 and 3 x 5 or (4 x 5 x 10) + (3 x 5). They will move from informal methods of calculating multiplication and division to formal written methods i.e. short column multiplication and be supported by using hands-on resources.

- ▪ Fractions

Children will develop their understanding of fractions and decimals and will be introduced to tenths. They will count and understand tenths as ten equal parts as well as through dividing sets of objects into ten equal parts / groups. They will find and write fractions of objects using their multiplication tables knowledge, e.g. 1/5 of a group of 20 buttons can be solved by 20 ÷ 5 = 4, and will continue to explore equivalent fractions using diagrams to explain their understanding e.g. 2/4 is equivalent to or of equal value to 4/8. They will also begin to add and subtract fractions where the denominator is the same e.g. 4/6 + 1/6 = 5/6.

Measurement

Child\ren will continue to measure, compare, add and subtract measurements and progress to mixed units e.g. expressing amounts as litres and millilitres – 2 litres 400ml. They will measure the perimeter of 2-D shapes and will continue to add and subtract amounts of money including giving change. Children will estimate and read time to the nearest minute on analogue and digital clock faces. They will be introduced to the Roman numerals I to XII to help with this. Problem solving and calculating with time will involve comparing the duration of events such as the length of favourite television programme or journeys to school. They will use language with increasing accuracy, such as seconds, minutes and hours; o'clock, a.m. / p.m., morning, afternoon, noon and midnight. They will need to recall the number of seconds in a minute and the number of days in each month, year and leap year.

Geometry

Children will accurately draw 2-D shapes with rulers measuring sides accurately.

They will make 3-D shapes to help them understand how they are composed and will recognise 3-D shapes in a range of places and contexts (e.g. buildings, packages) and use correct mathematical vocabulary to describe them. They will learn what a right angle is and know that two right angles make a half-turn, three make three quarters of a turn and four a complete turn as well as identify whether angles are greater than or less than a right angle . They will also be able to identify horizontal and vertical lines and pairs of perpendicular (ʟ) and parallel lines (=).

Statistics

Children will collect, organise, answer and pose questions about information using bar charts, pictograms and tables to answer questions such as 'how many more children prefer football to cricket?'.

YEAR 3 – Programme of Study						
Number and place value	**Addition and subtraction**	**Multiplication and division**	**Fractions**	**Measurement**	**Geometry: properties of shapes**	**Statistics**
Pupils should be taught to: count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number recognise the place value of each digit in a three-digit number (hundreds, tens, ones) compare and order numbers up to 1000 identify, represent and estimate numbers using different representations read and write numbers up to 1000 in numerals and in words solve number problems and practical problems involving these ideas	Pupils should be taught to: add and subtract numbers mentally, including: - a three-digit number and ones - a three-digit number and tens - a three-digit number and hundreds add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction estimate the answer to a calculation and use inverse operations to check answers Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction	Pupils should be taught to: recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects	Pupils should be taught to: count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10 recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators recognise and show, using diagrams, equivalent fractions with small denominators add and subtract fractions with the same denominator within one whole (for example, $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$) compare and order unit fractions, and fractions with the same denominators solve problems that involve all of the above	Pupils should be taught to: measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml) measure the perimeter of simple 2-D shapes add and subtract amounts of money to give change, using both £ and p in practical contexts tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes and hours; use vocabulary such as o'clock, a.m./p.m., morning, afternoon, noon and midnight know the number of seconds in a minute and the number of days in each month, year and leap year compare durations of events [for example to calculate the time taken by particular events or tasks]	Pupils should be taught to: draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them recognise that angles are a property of shape or a description of a turn identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle identify horizontal and vertical lines and pairs of perpendicular and parallel lines	Pupils should be taught to: interpret and present data using bar charts, pictograms and tables solve one-step and two-step questions[for example, 'How many more?' and 'How many fewer?'] using information presented in scaled bar charts and pictograms and tables

Nascot Wood Junior School – Mathematics Intent and Implementation

YEAR 3 – Programme of Study						
Number and place value	Addition and subtraction	Multiplication and division	Fractions	Measurement	Geometry: properties of shapes	Statistics
Pupils now use multiples of 2, 3, 4, 5, 8, 10, 50 and 100. They use larger numbers to at least 1000, applying partitioning related to place value using varied and increasingly complex problems, building on work in year 2 (for example, 146 = 100 and 40 and 6, 146 = 130 and 16). Using a variety of representations, including those related to measure, pupils continue to count in ones, tens and hundreds, so that they become fluent in the order and place value of numbers to 1000.	Pupils practise solving varied addition and subtraction questions. For mental calculations with two-digit numbers, the answers could exceed 100. Pupils use their understanding of place value and partitioning, and practise using columnar addition and subtraction with increasingly large numbers up to three digits to become fluent (see Appendix 1).	Pupils continue to practise their mental recall of multiplication tables when they are calculating mathematical statements in order to improve fluency. Through doubling, they connect the 2, 4 and 8 multiplication tables. Pupils develop efficient mental methods, for example, using commutativity and associativity (for example, 4 × 12 × 5 = 4 × 5 × 12 = 20 × 12 = 240) and multiplication and division facts (for example, using 3 × 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (30 × 2 = 60, 60 ÷ 3 = 20 and 20 = 60 ÷ 3). Pupils develop reliable written methods for multiplication and division, starting with calculations of two-digit numbers by one-digit numbers and progressing to the formal written methods of short multiplication and division. Pupils solve simple problems in contexts, deciding which of the four operations to use and why. These include measuring and scaling contexts, (for example, four times as high, eight times as long etc.) and correspondence problems in which m objects are connected to n objects (for example, 3 hats and 4 coats, how many different outfits?; 12 sweets shared equally between 4 children; 4 cakes shared equally between 8 children).	Pupils connect tenths to place value, decimal measures and to division by 10. They begin to understand unit and non-unit fractions as numbers on the number line, and deduce relations between them, such as size and equivalence. They should go beyond the [0, 1] interval, including relating this to measure. Pupils understand the relation between unit fractions as operators (fractions of), and division by integers. They continue to recognise fractions in the context of parts of a whole, numbers, measurements, a shape, and unit fractions as a division of a quantity. Pupils practise adding and subtracting fractions with the same denominator through a variety of increasingly complex problems to improve fluency.	Pupils continue to measure using the appropriate tools and units, progressing to using a wider range of measures, including comparing and using mixed units (for example, 1 kg and 200g) and simple equivalents of mixed units (for example, 5m = 500cm). The comparison of measures should also include simple scaling by integers (for example, a given quantity or measure is twice as long or five times as high) and this connects to multiplication. Pupils continue to become fluent in recognising the value of coins, by adding and subtracting amounts, including mixed units, and giving change using manageable amounts. They record £ and p separately. The decimal recording of money is introduced formally in year 4. Pupils use both analogue and digital 12-hour clocks and record their times. In this way they become fluent in and prepared for using digital 24-hour clocks in year 4.	Pupils' knowledge of the properties of shapes is extended at this stage to symmetrical and non-symmetrical polygons and polyhedra. Pupils extend their use of the properties of shapes. They should be able to describe the properties of 2-D and 3-D shapes using accurate language, including lengths of lines and acute and obtuse for angles greater or lesser than a right angle. Pupils connect decimals and rounding to drawing and measuring straight lines in centimetres, in a variety of contexts.	Pupils understand and use simple scales (for example, 2, 5, 10 units per cm) in pictograms and bar charts with increasing accuracy. They continue to interpret data presented in many contexts.

The Year 4 Learner

Working mathematically

By the end of year 4, children will apply their understanding of maths to solve a wide variety of problems with more than one step and be expected to prove their thinking through pictures, jottings and conversations. They will continue to make connections between different areas of maths and ask their own questions, working in an organised way to find solutions which help them identify common patterns or any errors more easily.

Number

- **Counting and understanding numbers**

Children will be very familiar with numbers that have up to 4 digits and will be able to order and compare by showing them in different ways such as on a tape measure or using hands-on resources. Using their understanding of place value (how the value of each digit changes depending on its position in the number), children will be able to partition (break and make) numbers in different ways e.g. 2345 = 2000 and 300 and 40 and 5 but could also represent this as 1000 and 1000 and 200 and 100 and 40 and 5 or 2000 and 200 and 145. They will work with numbers securely up to 10,000 and may begin to count beyond in 1s, 10s, 100s and 1000s. They will use this to help them find 10, 100 or 1000 more or less than any given number. They will multiply and divide whole numbers by 10 and 100 and understand that this changes the value of each digit rather than 'just adding a 0'. They will develop their understanding to decimal hundredths, comparing and ordering these using contexts such as money. Children will also learn about the pattern to find any Roman numeral to 100.

Children will develop their expertise when counting forwards and backwards from 0 to include multiples of 6, 7, 9 and 25; decimals with up to 2 places and fractions. They will be able to fluently count in tenths, hundredths and simple fractions. They will develop their understanding of negative numbers through counting backwards through 0. Children will be able to recognise and describe number patterns and relationships including multiples (e.g. 3, 6, 9, 12 are multiples of 3) and factor pairs (e.g. 1 and 12, 2 and 6, 3 and 4 are all factor pairs for 12) for known times tables.

- **Calculating**

Children will develop various strategies for solving +, -, x, ÷ calculations mentally, using jottings when appropriate and for checking that their answers are sensible. Children will be encouraged to share their methods with others to help them see which work best, are quickest and most accurate. Over the course of the year, children will become fluent in all multiplication and division facts up to 12 x 12 and apply these facts to other problems e.g. 232 x 7 = (200 x 7) + (30 x 7) + (2 x 7). Children will use the = sign to demonstrate equal value e.g. 3 x 8 = 48 ÷ 2 and solve missing number problems e.g. 3 x ? = 48÷2. They will explore patterns and rules for the times tables they learn and use pictures and objects to support their understanding.

Children will be required to solve problems accurately using the column addition and subtraction methods for numbers with up to 4-digits and explain how the methods work. They will use apparatus to secure their understanding of these. This will include addition and subtraction calculations with different numbers of digits (such as 1286 + 357); and numbers containing 0s (such as 8009 – 3231). They will use formal written methods of short multiplication and short division for

two and three digit numbers by a single digit. Children who become very adept at these types of calculations will be stretched through problems such as those containing missing numbers so that they know when, if and why they need to use the methods.

- **Fractions including decimals**

Children will develop their understanding of fractions by comparing to, or finding a part of, the whole. Through hands-on resources, pictures or jottings, such as a number line, children will add and subtract two fractions with the same denominator (e.g. 2/3 + 2/3). Children will solve problems involving fractions such as 'find ¾ of 20 litres' using their knowledge of multiplication and division and through practical equipment. Children secure their understanding that fractions and decimals are different ways of expressing numbers and proportions.

Measurement

Children secure their understanding of place value and decimals to record measurements accurately. They use their understanding of multiplying and dividing by 10, 100 and 1000 to convert between different units of measure of length (km, m, cm, mm), weight (kg, g) and money (£ and p). Children will link their understanding of area to multiplication and describe how to find the perimeter of a rectangle quickly. Children will read and write the time accurately using analogue and digital clocks, including clocks with Roman numerals. They will convert between units of time (hours, minutes and seconds). Children estimate, compare, calculate and solve a variety of problems involving all units of measurement.

Geometry

Children will extend their knowledge of shape to include more unusual quadrilaterals (four-sided shapes) and triangles. They will use increasingly more specific vocabulary such as parallelogram, rhombus and trapezium; scalene and isosceles. They refine their understanding of symmetry and solve problems where the shape is not displayed in its usual way (e.g. it might be on its side). Children find and name different angles and use this information to decide if a shape is regular or irregular. Children describe position and movement on a grid as co-ordinates and will plot points to draw 2-D shapes.

Statistics

Children will complete, read and interpret information on bar charts; they will solve problems that involve finding information in charts, tables and graphs; including time graphs.

YEAR 4 – Programme of Study							
Number and place value	Addition and subtraction	Multiplication and division	Fractions (including decimals)	Measurement	Geometry: properties of shapes	Geometry: position and direction	Statistics
Pupils should be taught to: ▪ count in multiples of 6, 7, 9, 25 and 1000 ▪ find 1000 more or less than a given number ▪ count backwards through zero to include negative numbers ▪ recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones) ▪ order and compare numbers beyond 1000 ▪ identify, represent and estimate numbers using different representations ▪ round any number to the nearest 10, 100 or 1000 ▪ solve number and practical problems that involve all of the above and with increasingly large positive numbers ▪ read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value	Pupils should be taught to: ▪ add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate ▪ estimate and use inverse operations to check answers to a calculation ▪ solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why	Pupils should be taught to: ▪ recall multiplication and division facts for multiplication tables up to 12 × 12 ▪ use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers ▪ recognise and use factor pairs and commutativity in mental calculations ▪ multiply two-digit and three-digit numbers by a one-digit number using formal written layout ▪ solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects	Pupils should be taught to: ▪ recognise and show, using diagrams, families of common equivalent fractions ▪ count up and down in hundredths; recognise that hundredths arise when dividing an object by a hundred and dividing tenths by ten. ▪ solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number ▪ add and subtract fractions with the same denominator ▪ recognise and write decimal equivalents of any number of tenths or hundredths ▪ recognise and write decimal equivalents to $\frac{1}{4}$; $\frac{1}{2}$; $\frac{3}{4}$ ▪ find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths ▪ round decimals with one decimal place to the nearest whole number ▪ compare numbers with the same number of decimal places up to two decimal places ▪ solve simple measure and money problems involving fractions and decimals to two decimal places	Pupils should be taught to: ▪ convert between different units of measure [for example, kilometre to metre; hour to minute] ▪ measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres ▪ find the area of rectilinear shapes by counting squares ▪ estimate, compare and calculate different measures, including money in pounds and pence ▪ read, write and convert time between analogue and digital 12 and 24-hour clocks ▪ solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days	Pupils should be taught to: ▪ compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes ▪ identify acute and obtuse angles and compare and order angles up to two right angles by size ▪ identify lines of symmetry in 2-D shapes presented in different orientations ▪ complete a simple symmetric figure with respect to a specific line of symmetry	Pupils should be taught to: ▪ describe positions on a 2-D grid as coordinates in the first quadrant ▪ describe movements between positions as translations of a given unit to the left/right and up/down ▪ plot specified points and draw sides to complete a given polygon	Pupils should be taught to: ▪ interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs ▪ solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs

YEAR 4 – Programme of Study							
Number and place value	Addition and subtraction	Multiplication and division	Fractions (including decimals)	Measurement	Geometry: properties of shapes	Geometry: position, and direction	Statistics
Using a variety of representations, including measures, pupils become fluent in the order and place value of numbers beyond 1000, including counting in tens and hundreds, and maintaining fluency in other multiples through varied and frequent practice. They begin to extend their knowledge of the number system to include the decimal numbers and fractions that they have met so far. They connect estimation and rounding numbers to the use of measuring instruments. Roman numerals should be put in their historical context so pupils understand that there have been different ways to write whole numbers and that the important concepts of zero and place value were introduced over a period of time.	Pupils continue to practise both mental methods and columnar addition and subtraction with increasingly large numbers to aid fluency (see Mathematics Appendix 1).	Pupils continue to practise recalling and using multiplication tables and related division facts to aid fluency. Pupils practise mental methods and extend this to three-digit numbers to derive facts (for example 600 ÷ 3 = 200 can be derived from 2 x 3 = 6). Pupils practise to become fluent in the formal written method of short multiplication and short division with exact answers (see Mathematics Appendix 1). Pupils write statements about the equality of expressions (for example, use the distributive law 39 × 7 = 30 × 7 + 9 × 7 and associative law (2 × 3) × 4 = 2 × (3 × 4)). They combine their knowledge of number facts and rules of arithmetic to solve mental and written calculations for example, 2 x 6 x 5 = 10 x 6 = 60. Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as the numbers of choices of a meal on a menu, or three cakes shared equally between 10 children.	Pupils should connect hundredths to tenths and place value and decimal measure. They extend the use of the number line to connect fractions, numbers and measures. Pupils understand the relation between non-unit fractions and multiplication and division of quantities, with particular emphasis on tenths and hundredths Pupils make connections between fractions of a length, of a shape and as a representation of one whole or set of quantities. Pupils use factors and multiples to recognise equivalent fractions and simplify where appropriate (for example, $\frac{6}{9} = \frac{2}{3}$ or $\frac{1}{4} = \frac{2}{8}$). Pupils continue to practice adding and subtracting fractions with the same denominator, to become fluent through a variety of increasingly complex problems beyond one whole. Pupils are taught throughout that decimals and fractions are different ways of expressing numbers and proportions. Pupils' understanding of the number system and decimal place value is extended at this stage to tenths and then hundredths. This includes relating the decimal notation to division of whole number by 10 and later 100. They practise counting using simple fractions and decimal fractions, both forwards and backwards. Pupils learn decimal notation and the language associated with it, including in the context of measurements. They make comparisons and order decimal amounts and quantities that are expressed to the same number of decimal places. They should be able to represent numbers with one or two decimal places in several ways, such as on number lines.	Pupils build on their understanding of place value and decimal notation to record metric measures, including money. They use multiplication to convert from larger to smaller units. Perimeter can be expressed algebraically as 2(a + b) where a and b are the dimensions in the same unit. They relate area to arrays and multiplication.	Pupils continue to classify shapes using geometrical properties, extending to classifying different triangles (for example, isosceles, equilateral, scalene) and quadrilaterals (for example, parallelogram, rhombus, trapezium). Pupils compare and order angles in preparation for using a protractor and compare lengths and angles to decide if a polygon is regular or irregular. Pupils draw symmetric patterns using a variety of media to become familiar with different orientations of lines of symmetry; and recognise line symmetry in a variety of diagrams, including where the line of symmetry does not dissect the original shape.	Pupils draw a pair of axes in one quadrant, with equal scales and integer labels. They read, write and use pairs of coordinates, for example (2, 5), including using coordinate-plotting ICT tools.	Pupils understand and use a greater range of scales in their representations. Pupils begin to relate the graphical representation of data to recording change over time.

The Year 5 Learner

Working mathematically

By the end of year 5, children will apply their mathematical experiences to explore ideas and raise relevant questions, constructing complex explanations and reasoned arguments. They will be able to solve a wide variety of complex problems which require sustained concentration and demand efficient written and mental methods of calculations. These will include problems relating to fractions, scaling (times as many), converting between units of measure and employ all four operations (+, -, x, ÷).

Number

- ### Counting and understanding numbers

Children extend and apply their knowledge of place value for numbers up to one million, rounding, estimating and comparing them (including decimals and negative numbers) in a variety of situations. They are introduced to powers of ten and are able to count forwards or backwards from any number (for example, -50, -5... 5, 50, 500, 5000...). Through investigations, they will discover special numbers including factors, primes, square and cube numbers.

- ### Calculating

Children will be fluent in a wide range of mental calculation strategies for all operations and will select the most appropriate method dependent on the calculation. They apply their knowledge of place value fluently to multiply and divide numbers (including decimals) by 10, 100 and 1000. When mental methods are not appropriate, they use formal written methods of addition and subtraction accurately. They continue to develop their understanding of the formal methods through hands-on resources and use their known facts within long multiplication (up to 4 digit numbers by 2 digit numbers e.g. 2345 x 68) and short division (up to 4 digit numbers by 1 digit number e.g. 2345 ÷ 7) which may result in remainders. They solve multi-step problems in meaningful contexts and decide which operations to use.

- ### Fractions including decimals and percentages

Children secure their strong understanding that fractions express a proportion of amounts and quantities (such as measurements), shapes and other visual representations. Children extend their knowledge and understanding of the connections between fractions and decimals to also include percentages. They will be able to derive simple equivalences (e.g. 67% = 67/100 = 0.67) and recall percentage and decimal equivalents for ½, ¼, 1/5, 2/5, 4/5 and fractions with a denominator of a multiple of 10 or 25 (e.g. 25% = 25/100).

They order, add and subtract fractions, including mixed numbers and those whose denominators are multiples of the same number, for example $\frac{3}{10} + \frac{1}{5} = \frac{3}{10} + \frac{2}{10} = \frac{5}{10} = \frac{1}{2}$. Using apparatus, images and models, they multiply proper fractions and mixed numbers by whole numbers. Children continue to develop their understanding of fractions as numbers, measures and operators by finding fractions of numbers and quantities in real life situations.

Measurement

Through a wide variety of practical experiences and hands-on resources, children extend their understanding of measurement. They convert larger to smaller related units of measure and vice-versa including length, capacity, weight, time and money. Children will convert between imperial (such as inches, pints, miles) and metric units (such as centimetres, litres, kilometres). Children will measure, calculate and solve problems involving perimeter of straight-sided, right-angled shapes (rectilinear) and learn to express this algebraically such as, $4 + 2b = 20$. They find and measure the area of these shapes with increasing accuracy. They begin to estimate volume.

Geometry

Children will measure, identify and draw angles in degrees, developing a strong understanding of acute, obtuse, reflex and right angles. They use this knowledge to find missing angles and lengths in a variety of situations, including at a point, on a straight line and within a shape. Children will move (translate), reflect shapes and describe their new positions. Language will be used with increasing sophistication to compare and classify shapes based on their properties and size. They will be able to visualise 3-D shapes from 2-D diagrams. They will use their understanding or shapes to solve problems.

Statistics

Children will complete, read and solve comparison, sum and difference problems using information presented in graphs, charts and tables, including timetables. They begin to decide which representations of data are the most appropriate and are able to justify their reasons.

YEAR 5 – Programme of Study							
Number and place value	Addition and subtraction	Multiplication and division	Fractions (including decimals and percentages)	Measurement	Geometry: properties of shapes	Geometry: position and direction	Statistics
Pupils should be taught to: read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000 interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000 solve number problems and practical problems that involve all of the above read Roman numerals to 1000 (M) and recognise years written in Roman numerals	Pupils should be taught to: add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) add and subtract numbers mentally with increasingly large numbers use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why	Pupils should be taught to: identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers. know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers establish whether a number up to 100 is prime and recall prime numbers up to 19 multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers multiply and divide numbers mentally drawing upon known facts ▪ divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context ▪ multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 ▪ recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3}) ▪ solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes ▪ solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign ▪ solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates	Pupils should be taught to: compare and order fractions whose denominators are all multiples of the same number identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number [for example, $\frac{2}{5} + \frac{4}{5} = \frac{6}{5} = 1\frac{1}{5}$] add and subtract fractions with the same denominator and multiples of the same number multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams read and write decimal numbers as fractions [for example, $0.71 = \frac{71}{100}$] recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents round decimals with two decimal places to the nearest whole number and to one decimal place read, write, order and compare numbers with up to three decimal places solve problems involving number up to three decimal places recognise the per cent symbol (%) and understand that per cent relates to "number of parts per hundred", and write percentages as a fraction with denominator 100, and as a decimal solve problems which require knowing percentage and decimal equivalents of $\frac{1}{2}, \frac{1}{4}, \frac{1}{5}, \frac{2}{5}, \frac{4}{5}$ and those with a denominator of a multiple of 10 or 25	Pupils should be taught to: convert between different units of metric measure (for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre) understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres calculate and compare the area of rectangles (including squares) using standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes estimate volume [for example, using 1 cm^3 blocks to build cuboids(including cubes)] and capacity[for example, using water] solve problems involving converting between units of time use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation including scaling	Pupils should be taught to: identify 3-D shapes, including cubes and other cuboids, from 2-D representations know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles draw given angles, and measure them in degrees ($^\circ$) identify: - angles at a point and one whole turn (total 360°) - angles at a point on a straight line and ½ a turn (total 180°) - other multiples of 90° ▪ use the properties of rectangles to deduce related facts and find missing lengths and angles ▪ distinguish between regular and irregular polygons based on reasoning about equal sides and angles	Pupils should be taught to: identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed	Pupils should be taught to: solve comparison, sum and difference problems using information presented in a line graph complete, read and interpret information in tables, including timetables

YEAR 5 – Programme of Study							
Number and place value	Addition and subtraction	Multiplication and division	Fractions (including decimals and percentages)	Measurement	Geometry: properties of shapes	Geometry: position and direction	Statistics
Pupils identify the place value in large whole numbers.

They continue to use number in context, including measurement. Pupils extend and apply their understanding of the number system to the decimal numbers and fractions that they have met so far.

They should recognise and describe linear number sequences (for example, 3, 3 ½ , 4, 4 1/2 …), including those involving fractions and decimals, and find the term-to-term rule in words (for example, add ½). | Pupils practise using the formal written methods of columnar addition and subtraction with increasingly large numbers to aid fluency (see Mathematics Appendix 1).

They practise mental calculations with increasingly large numbers to aid fluency (for example, 12 462 – 2 300 = 10 162). | Pupils practise and extend their use of the formal written methods of short multiplication and short division (see Mathematics Appendix 1). They apply all the multiplication tables and related division facts frequently, commit them to memory and use them confidently to make larger calculations.

They use and understand the terms factor, multiple and prime, square and cube numbers.

Pupils interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding (for example, 98 ÷ 4 = 98/4 = 24 r 2 = $24\frac{1}{2}$ = 24.5 ≈ 25).

Pupils use multiplication and division as inverses to support the introduction of ratio in year 6, for example, by multiplying and dividing by powers of 10 in scale drawings or by multiplying and dividing by powers of a 1000 in converting between units such as kilometres and metres.

Distributivity can be expressed as a(b + c) = ab + ac.

They understand the terms factor, multiple and prime, square and cube numbers and use them to construct equivalence statements (for example, 4 x 35 = 2 x 2 x 35; 3 x 270 = 3 x 3 x 9 x 10 = 9^2 x 10).

Pupils use and explain the equals sign to indicate equivalence, including in missing number problems (for example, 13 + 24 = 12 + 25; 33 = 5 x □). | Pupils should be taught throughout that percentages, decimals and fractions are different ways of expressing proportions. They extend their knowledge of fractions to thousandths and connect to decimals and measures. Pupils connect equivalent fractions > 1 that simplify to integers with division and other fractions > 1 to division with remainders, using the number line and other models, and hence move from these to improper and mixed fractions.

Pupils connect multiplication by a fraction to using fractions as operators (fractions of), and to division, building on work from previous years. This relates to scaling by simple fractions, including fractions > 1. Pupils practise adding and subtracting fractions to become fluent through a variety of increasingly complex problems. They extend their understanding of adding and subtracting fractions to calculations that exceed 1 as a mixed number.
Pupils continue to practise counting forwards and backwards in simple fractions.
Pupils continue to develop their understanding of fractions as numbers, measures and operators by finding fractions of numbers and quantities.
Pupils extend counting from year 4, using decimals and fractions including bridging zero, for example on a number line.
Pupils say, read and write decimal fractions and related tenths, hundredths and thousandths accurately and are confident in checking the reasonableness of their answers to problems.
They mentally add and subtract tenths, and one-digit whole numbers and tenths.
They practise adding and subtracting decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1 (for example, 0.83 + 0.17 = 1).
Pupils should go beyond the measurement and money models of decimals, for example, by solving puzzles involving decimals.
Pupils should make connections between percentages, fractions and decimals (for example, 100% represents a whole quantity and 1% is 1/100, 50% is 50/100, 25% is 25/100) and relate this to finding 'fractions of'. | Pupils use their knowledge of place value and multiplication and division to convert between standard units.

Pupils calculate the perimeter of rectangles and related composite shapes, including using the relations of perimeter or area to find unknown lengths. Missing measures questions such as these can be expressed algebraically, for example 4 + 2b = 20 for a rectangle of sides 2 cm and b cm and perimeter of 20cm.

Pupils calculate the area from scale drawings using given measurements.

Pupils use all four operations in problems involving time and money, including conversions (for example, days to weeks, expressing the answer as weeks and days). | Pupils become accurate in drawing lines with a ruler to the nearest millimetre, and measuring with a protractor. They use conventional markings for parallel lines and right angles.

Pupils use the term diagonal and make conjectures about the angles formed between sides, and between diagonals and parallel sides , and other properties of quadrilaterals, for example using dynamic geometry ICT tools.

Pupils use angle sum facts and other properties to make deductions about missing angles and relate these to missing number problems. | Pupils recognise and use reflection and translation in a variety of diagrams, including continuing to use a 2-D grid and coordinates in the first quadrant. Reflection should be in lines that are parallel to the axes. | Pupils connect their work on coordinates and scales to their interpretation of time graphs.

They begin to decide which representations of data are most appropriate and why. |

Working mathematically

By the end of year 6, children will structure their own investigations and solve a wide variety of increasingly complex problems. They will independently develop their own lines of enquiry and be expected to prove their solutions in a variety of ways including algebra, negative proof (use a counter example to prove the rule) and be able to communicate their results using accurate mathematical language. Children will demonstrate secure knowledge and confidence to talk in depth about mathematical concepts and explain their solutions, decisions and reasoning.

Number

- **Counting and understanding numbers**

Children extend and apply their knowledge of place value for numbers up to and beyond one million (including decimals and negative numbers) in a variety of situations. Special numbers are extended to include common factors, common multiples and a deeper understanding of prime numbers. Children will be able to round numbers and identify what degree of accuracy is appropriate.

- **Calculating**

Children will be fluent in a wide range of mental and formal written calculation strategies for all operations, extending to long division (four digit numbers by two digit numbers) by the end of the year. They will apply estimation in a range of ways. Through investigations, they explore the effect of the order of operations including the use of brackets.

- **Fractions including decimals and percentages**

Children recall and using equivalences between simple fractions, decimals and percentages. Additionally, they are able to express fractions in their simplest form and calculate the decimal equivalent, for example $\frac{3}{8} = 3 \div 8 = 0.375$.

Applying this understanding of equivalent fractions, children will order, add and subtract fractions (including mixed numbers and those with different denominators) by the end of the year e.g. $\frac{1}{3} + \frac{1}{4} + \square = 1$. Using hands-on resources and images, they will multiply and divide proper fractions and mixed numbers by whole numbers e.g. $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$ and $\frac{1}{3} \div 2 = \frac{1}{6}$. Children will solve problems involving the calculation of percentages linked to real life situations.

Ratio and proportion

Pupils explore ratio and proportion through real life experiences such as changing the quantities in recipes (scaling), scale drawings and maps.

Algebra

Throughout their primary experience children will have encountered algebra in a number of different situations which is drawn together and formalised in year 6. By the end of the year, they will confidently use symbols and letters to represent variables and unknowns in mathematical situations that they already understand, for example, simple formula and equivalent expressions a+b = b+a. Children will describe number sequences and missing number calculations.

Measurement

Through investigation and problem solving, children convert between a range of measurement units (including both imperial and metric). Calculation of perimeter and area is extended to include parallelograms and triangles. Additionally, they will explore the relationship between area and perimeter. They will know how to calculate, estimate and compare volume of cubes and cuboids identifying when it is appropriate to use formula.

Geometry

Children will draw 2-D and build 3-D shapes with accuracy using given dimensions and angles. They will create nets of common 3-D shapes. They will consolidate their knowledge of angles within shapes and extend it to find missing angles in triangles, quadrilaterals and regular polygons. Children name parts of circles, including radius, diameter and circumference, and explore the relationships between these elements. Children will use four quadrant co-ordinate grids to describe positions, draw and translate simple shapes. Using their knowledge of the properties of shape, they will be able to predict missing co-ordinates and express these algebraically.

Statistics

Children will increase their knowledge of different data representations to include interpreting and constructing pie charts (using their knowledge of angles, fractions and percentages) and line graphs (e.g. miles to km conversion). They will know when it is appropriate to use the mean as an average and how to calculate it.

YEAR 6 – Programme of Study								
Number and place value	Addition, subtraction, multiplication and division	Fractions (including decimals and percentages)	Ratio and proportion	Algebra	Measurement	Geometry: properties of shapes	Geometry: position, and direction	Statistics
Pupils should be taught to: read, write, order and compare numbers up to 10 000 000 and determine the value of each digit round any whole number to a required degree of accuracy use negative numbers in context, and calculate intervals across zero solve number and practical problems that involve all of the above	Pupils should be taught to: multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context ■ divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context ■ perform mental calculations, including with mixed operations and large numbers. ■ identify common factors, common multiples and prime numbers ■ use their knowledge of the order of operations to carry out calculations involving the four operations ■ solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why ■ solve problems involving addition, subtraction, multiplication and division ■ use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy	Pupils should be taught to: use common factors to simplify fractions; use common multiples to express fractions in the same denomination compare and order fractions, including fractions >1 add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$] ▢ divide proper fractions by whole numbers [for example, $\frac{1}{3} \div 2 = \frac{1}{6}$] associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, $\frac{3}{8}$] ■ identify the value of each digit to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places ■ multiply one-digit numbers with up to two decimal places by whole numbers ■ use written division methods in cases where the answer has up to two decimal places ■ solve problems which require answers to be rounded to specified degrees of accuracy ■ recall and use equivalences between simple fractions, decimals and percentages, including in different contexts	Pupils should be taught to: solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts solve problems involving the calculation of percentages [for example, of measures such as 15% of 360] and the use of percentages for comparison solve problems involving similar shapes where the scale factor is known or can be found solve problems involving unequal sharing and grouping using knowledge of fractions and multiples	Pupils should be taught to: use simple formulae generate and describe linear number sequences express missing number problems algebraically find pairs of numbers that satisfy an equation with two unknowns enumerate possibilities of combinations of two variables	Pupils should be taught to: solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places convert between miles and kilometres recognise that shapes with the same areas can have different perimeters and vice versa recognise when it is possible to use formulae for area and volume of shapes calculate the area of parallelograms and triangles calculate, estimate and compare volume of cubes and cuboids using standard units, including centimetre cubed (cm^3) and cubic metres (m^3), and extending to other units [for example mm^3 and km^3]	Pupils should be taught to: draw 2-D shapes using given dimensions and angles recognise, describe and build simple 3-D shapes, including making nets compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles	Pupils should be taught to: ■ describe positions on the full coordinate grid (all four quadrants) ■ draw and translate simple shapes on the coordinate plane, and reflect them in the axes	Pupils should be taught to: ■ interpret and construct pie charts and line graphs and use these to solve problems ■ calculate and interpret the mean as an average

Nascot Wood Junior School – Mathematics Intent and Implementation

Number and place value	Addition, subtraction, multiplication and division	Fractions (including decimals and percentages)	Ratio and proportion	Algebra	Measurement	Geometry: properties of shapes	Geometry: position and direction	Statistics
Pupils use the whole number system, including saying, reading and writing numbers accurately.	Pupils practise addition, subtraction, multiplication and division for larger numbers, using the formal written methods of columnar addition and subtraction, short and long multiplication, and short and long division (see Mathematics Appendix 1). They undertake mental calculations with increasingly large numbers and more complex calculations. Pupils continue to use all the multiplication tables to calculate mathematical statements in order to maintain their fluency. Pupils round answers to a specified degree of accuracy, for example, to the nearest 10, 20, 50 etc, but not to a specified number of significant figures. Pupils explore the order of operations using brackets; for example, $2 + 1 \times 3 = 5$ and $(2 + 1) \times 3 = 9$. Common factors can be related to finding equivalent fractions.	Pupils should practise, use and understand the addition and subtraction of fractions with different denominators by identifying equivalent fractions with the same denominator. They should start with fractions where the denominator of one fraction is a multiple of the other (for example, $½ + 1/8 = 5/8$) and progress to varied and increasingly complex problems. Pupils should use a variety of images to support their understanding of multiplication with fractions. This follows earlier work about fractions as operators (fractions of), as numbers, and as equal parts of objects, for example as parts of a rectangle. Pupils use their understanding of the relationship between unit fractions and division to work backwards by multiplying a quantity that represents a unit fraction to find the whole quantity (for example, if ¼ of a length is 36cm, then the whole length is $36 \times 4 = 144$cm). They practise calculations with simple fractions and decimal fraction equivalents to aid fluency, including listing equivalent fractions to identify fractions with common denominators. Pupils can explore and make conjectures about converting a simple fraction to a decimal fraction (for example, $3 \div 8 = 0.375$). For simple fractions with recurring decimal equivalents, pupils learn about rounding the decimal to three decimal places, or other appropriate approximations depending on the context. Pupils multiply and divide numbers with up to two decimal places by one-digit and two-digit whole numbers. Pupils multiply decimals by whole numbers, starting with the simplest cases, such as $0.4 \times 2 = 0.8$, and in practical contexts, such as measures and money. Pupils are introduced to the division of decimal numbers by one-digit whole number, initially, in practical contexts involving measures and money. They recognise division calculations as the inverse of multiplication. Pupils also develop their skills of rounding and estimating as a means of predicting and checking the order of magnitude of their answers to decimal calculations. This includes rounding answers to a specified degree of accuracy and checking the reasonableness of their answers.	Pupils recognise proportionality in contexts when the relations between quantities are in the same ratio (for example, similar shapes, recipes). Pupils link percentages or 360° to calculating angles of pie charts. Pupils should consolidate their understanding of ratio when comparing quantities, sizes and scale drawings by solving a variety of problems. They might use the notation a:b to record their work. Pupils solve problems involving unequal quantities for example, 'for every egg you need three spoonfuls of flour', '$\frac{3}{5}$ of the class are boys'. These problems are the foundation for later formal approaches to ratio and proportion.	Pupils should be introduced to the use of symbols and letters to represent variables and unknowns in mathematical situations that they already understand, such as: ■ missing numbers, lengths, coordinates and angles ■ formulae in mathematics and science ■ equivalent expressions (for example, $a + b = b + a$) ■ generalisations of number patterns ■ number puzzles (for example, what two numbers can add up to).	Pupils connect conversion (for example, from kilometres to miles) to a graphical representation as preparation for understanding linear/proportional graphs. They know approximate conversions and are able to tell if an answer is sensible. Using the number line, pupils use, add and subtract positive and negative integers for measures such as temperature. They relate the area of rectangles to parallelograms and triangles, for example, by dissection, and calculate their areas, understanding and using the formulae (in words or symbols) to do this. Pupils could be introduced to compound units for speed, such as miles per hour, and apply their knowledge in science or other subjects as appropriate.	Pupils draw shapes and nets accurately, using measuring tools and conventional markings and labels for lines and angles. Pupils describe the properties of shapes and explain how unknown angles and lengths can be derived from known measurements. These relationships might be expressed algebraically for example, $d = 2 \times r$; $a = 180 - (b + c)$.	Pupils draw and label a pair of axes in all four quadrants with equal scaling. This extends their knowledge of one quadrant to all four quadrants, including the use of negative numbers. Pupils draw and label rectangles (including squares), parallelograms and rhombuses, specified by coordinates in the four quadrants, predicting missing coordinates using the properties of shapes. These might be expressed algebraically for example, translating vertex (a, b) to (a-2, b+3); (a, b) and (a+d, b+d) being opposite vertices of a square of side d.	Pupils connect their work on angles, fractions and percentages to the interpretation of pie charts. Pupils both encounter and draw graphs relating two variables, arising from their own enquiry and in other subjects. They should connect conversion from kilometres to miles in measurement to its graphical representation. Pupils know when it is appropriate to find the mean of a data set

Nascot Wood Junior School – Mathematics Intent and Implementation

Curriculum Impact

- Deep and sustainable learning
- Ability to build on something already mastered
- Ability to reason about a concept and make connections to other concepts
- Procedural fluency with conceptual understanding - the understanding of how and why it all works
- Development of a growth mind-set – we are all mathematicians
- Resilience and perseverance
- Ability to thrive in a mathematically driven world Nascot Wood Junior School Mathematics Intent and Implementation

Wider Impact

- KS2 results are consistently above national and Hertfordshire measures

- The school is consistently graded as outstanding by our Hertfordshire Improvement Partner

- Anecdotal evidence suggests that our past pupils do well at GCSE and A level, and are highly valued by secondary colleagues

- There is a large percentage of children each year who gain places at high performing secondary schools, both in the state and private sector

We evaluate the impact of what we teach by...

- Carefully monitoring and reporting on the progress and attainment of individual children and groups of children, and ensuring that staff have access to this information to inform their planning

- Identifying gaps between disadvantaged children and other children, and ways to address gaps if they occur

- Regularly consulting with children

- Working in partnership with parents

This process of evaluation results in a continuous and relentless striving for marginal gains improvement